

device using a cable for power or data transfer. Similar but derivative implementations should be evident for those skilled in the art.

[0035] In yet additional embodiments, when CE devices are pre-configured by the user, the CE devices may be required to perform authentication prior to initiation of wireless power or data transfer. Thus, in one implementation, when one CE device comes into predetermined proximity from another CE device, they can start data exchange to perform an authenticate procedure. The authenticate procedure can involve exchanging identifications, keys, logins, passwords, requests, wireless coupling parameters, and so forth. In yet additional examples, the authenticate procedure can involve determining if one or more CE devices has a predetermined software (e.g., whether a predetermined proprietary mobile application) installed. If the authentication of CE devices is successful, wireless power or data transfer becomes authorized and can be initiated by CE devices. Alternatively, if the authentication of CE devices fails, wireless power or data transfer is not authorized and cannot be initiated by CE devices.

[0036] Referring now to the drawings, exemplary embodiments are described. The drawings are schematic illustrations of idealized example embodiments. Thus, the example embodiments discussed herein should not be construed as limited to the particular illustrations presented herein, rather these example embodiments can include deviations and differ from the illustrations presented herein.

[0037] FIG. 1A shows a simplified block diagram of two CE devices **112**, **114** positioned proximate each other, in accordance with some embodiments. FIG. 1B illustrates multiple CE devices **130-134** positioned proximate each other, in accordance with some embodiments. The CE devices each include an antenna system, module, or circuitry **116** that is configured to provide wireless power transfer and/or wireless data communications between two or more CE devices. Accordingly, the CE devices utilize the antenna system to cooperatively couple with one or more other CE devices to enable the wireless transfer of power between at least a first CE device (e.g., CE device **112**) and a second CE device (e.g., CE device **114**), or to wirelessly communicate between the first and second CE devices. As such, electrical power can be transferred, for example, from first CE device **112** to second CE device **114**, which may allow second CE device **114** to continue to operate or to at least partially store electrical power to be used by the second CE device **114**. The CE devices can be substantially any relevant CE device that is configured with an antenna system **116**. As discussed above, the CE devices can be a smart phone, tablet, laptop, television, set-top-box, game controller, cell phone, portable gaming device, game console, multimedia player, entertainment system, vehicle navigation system, quadcopter, charging device, battery pack, power tool, portable charger, VR device, and the like. Further, the CE devices do not have to be the same type of device. Power or data transfer between CE devices can be established when these devices are within a predetermined range from one another, which can be up to several feet.

[0038] In some embodiments, at least one of the CE devices can include a pad, mat, container, or platform for receiving one or more other CE devices. For example, when one of the CE devices is implemented as a remotely controlled aircraft, such as a quadcopter or drone, it may include a platform for receiving another CE device, e.g., a smart-

phone. The use of quadcopters can be especially helpful when users of CE devices (e.g., smartphones) travel to areas with low network bandwidth or coverage, or when a battery level of a CE device becomes low and there are no power charging opportunities in the area. In these instances, a user of the CE device can request the quadcopters to arrive to an area near the user to provide wireless power transfer (e.g., to charge the user's CE device) and/or provide wireless data transfer (e.g., to provide access to the Internet, remote storage, download files, movies, etc.).

[0039] FIG. 2A shows a representation of two exemplary smart phone portable CE devices **112**, **114** positioned proximate each other, in accordance with some embodiments. FIG. 2B shows a representation of multiple exemplary portable CE devices **130-134** positioned proximate each other, in accordance with some embodiments. In this representation, the CE devices can be, for example, a set-top-box **130**, a multimedia player **131**, television **132**, a tuner or stereo **133**, and a smart phone **134**. In this example embodiment, some or all of the CE devices **130-134** can be also connected (but not necessarily) using one or more cables, wires, or wired interface for power or data transfer.

[0040] FIG. 3 depicts a simplified plane view of an exemplary antenna system **310**, in accordance with some embodiments. Antenna system **310** includes an antenna array comprising one or more power transfer antennas **312** or one or more low power communications antennas **314-317**. The power transfer antenna **312** is configured to enable at least one of wirelessly and inductively receiving electrical power from another consumer electronic device and wirelessly and inductively transmitting electrical power to another consumer electronic device. In many applications, the antenna system can be configured to transmit and receive power. Similarly, one or more communications antennas **314-317** are configured to wirelessly transmit and receive communications with one or more other remote devices. Further, the communications antennas and corresponding drive circuitry (not illustrated) are, in some implementations, configured to provide low power wireless communications such that the distance of the wireless communication is relatively limited.

[0041] In some embodiments, antenna system **310** includes a controller and/or one or more driver circuitries **318** that can control and/or drive the antennas **312**, **314-317**. The controller can further store and/or determine coupling parameters of the antenna system and/or other antenna systems. In other embodiments, some or all of the functionality of controller **318** is performed by one or more controllers and/or processors of the CE device. Further, in some embodiments, antenna system **310** includes a frame **320**, base, housing, or other such structure. Each of the power transfer antenna **312** and the one or more communications antennas **314-317** include leads **324**, pins, wires, or other such electrical connectors to allow the power transfer antenna and communications antennas to couple with power, control, and/or drive circuitry. The leads **324** may couple with other components within the CE device. In some implementations, antenna system **310** includes one or more connectors **330**, and the leads **324** couple with a connector **330** of antenna system **310**. Connector **330** can be configured to cooperate with one or more mating connectors of the CE device. In some embodiments, one or more antenna systems may be similar to the antenna systems described in co-pending U.S. application Ser. Nos. 14/290,409, 14/290,426, and 14/460,224, which are incorporated herein by